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SOME ACCOUNT OF THE NATURAL HISTORY OF THE FANNING GROUP OF ISLANDS.

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THE collection of islands which we have here designated by the name of Fanning's Group consists of four coral islands situated in the Pacific Ocean, immediately north of the equator. I am not aware that they have ever been grouped on any chart, but, inasmuch as they form a natural group, and as three of them were discovered by Captain Edmund Fanning, an American sailor, I think we are justified in describing them under the above title. They stretch from latitude 1° 57′ N. to 5° 49′ N., and from longitude 157° 27′ W. to 162° 11′ W., and, like most other groups in the Pacific, their general direction is northwest and southeast, thereby conforming to the general trend of the submarine range of mountains whose peaks they cap. As their formation is purely coral, their geological structure is comparatively simple.

The most westward, and evidently the last formed of the group, is Palmyra. Caldew Reef, forty miles to the northward of Palmyra, has hardly, as yet, assumed the distinctive features of an island. It is entirely under water at high tide, and but a few coral heads project here and there above the surface at low water. In the course of time, however, it will undoubtedly be added to the group. Palmyra represents the second stage in the formation of a coral island. The winds, waves, and currents, assisted probably by some other agents, have been at work on the surface coral, and have ground it and piled it up beyond the reach of the highest tides. It now consists of fifty-eight small islets, thickly clothed with vegetation, arranged in the form of an elongated horseshoe opened to the westward, and inclosing four lagoons. The islets are separated one from another by nar-

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row, shallow channels, through which the water of the ocean finds free access to the lagoons. In a completed atoll the rim of land inclosing the lagoon is unbroken, but in the greater number of coral islands a narrow lagoon-outlet is always found on the western side.

A broad, interior shore platform of fine coral sand extends, in places, from one side of the island to the other, and forms distinct boundaries for the lagoons, and connects together most of the islets. It also forms a barrier to the westward, approximating the two extremities of the horseshoe, leaving the lagoon-outlets so very narrow and shallow as hardly to admit of the passage of a ship's boat. The outer shore platform is about three hundred feet wide, and is covered with coarse coral blocks.

The island is being gradually extended to the westward. From the two ends of the horseshoe the water breaks out for a mile or more, and from the northern end it shoals around in a curve to the southward for three or four miles. This, too, in years to come, will be elevated above the surface and another body of water will be inclosed, forming a lagoon where vessels now ride at anchor.

Very scanty evidence of any agents having been at work in building up the land other than the coral animal and the action of the waves are observable anywhere about the island. The highest point is only seven feet above high water. In no place has the reef-rock been upheaved. But an elevation of a few inches might be supposed from the position of the rock of beach formation, which in places has been lifted up horizontally out of the reach of the tides.

The eastern islets are the oldest in formation. That this is true is evident from several facts. In the first place, the vegetation there is denser and ranker, and more genera are represented than on the islets to the leeward. All the plants that were found growing on the latter islets also exist on the eastern, with the addition of several species that have not yet been diffused to the westward, showing that the germs of life started into existence in the east, the direction of the prevailing wind and current. A further proof of this is shown in the condition of the cocoanut-trees in the different localities. This tree when young is bulbous at the base, a condition which is observable in all the trees on the western islets, while on those to the windward they are taller and the trunks have nearly the same diameter from the base to the crown.

Washington Island, the most remarkable of the group, presents several very interesting geological features. The evidences of the operation of some great disturbing agent are more plainly visible here than elsewhere. Either this force must have been extremely local in its operation, or else it was exerted upon the member of the group which we have just considered when it was in such a condition as not to show it. The latter hypothesis is the most reasonable. Washington Island is an obliterated atoll. In the place of the usual salt water lagoon there is a lake of fresh water, one mile long and half a mile wide, with a depth of four fathoms in its deepest part. No shore platform makes out from the land at low water, but the sea at all stages of the tide breaks directly on the beach, except at the angles of the island where reefs extend a certain distance into the sea. The beach shelves rather abruptly to the water's edge. The highest part of the land is about fifteen feet high, and over all the interior of the island there are outcroppings of the reef-rock and the rock of beach formation. All traces of the former passage from the sea into the lagoon have been obliterated. The salt water of the lagoon has either drained off through the light, porous soil, or has been freshened by the immense rain-falls which occur in these latitudes. The latter event is not improbable, considering the situation of the island on the edge of the trades, in the region of variable winds, where rains are frequent and heavy.

In time past, the rim of land inclosed three lagoons. One, the largest, is now the lake; the others are about half the size of the first, and are converted into peat-bogs. The latter are thickly overgrown with rushes and contain a solid deposit of vegetable matter three or four feet deep, composed of the roots, trunks, and *débris* of the cocoanut and pandanus trees closely matted by the roots of the rushes. The time of our visit was just after a heavy rain, and a layer of water from six to eighteen inches deep covered the surface of the bogs.

The island supports a dense and luxuriant growth of vegetation, and a greater number of species are represented there than on any of the other islands of the group.

The water of the lake is just perceptibly brackish; and the only life it is said to contain are a species of eel and a shrimp, both of which we were told are different from anything found in the water surrounding the island. This information was derived from an intelligent Englishman, who had visited the island several times to superintend the gathering of the cocoanuts. They are the kinds of life that we should look upon as being the first to adapt themselves to the altered condition of things. Unfortunately we were not able to procure a specimen of either. Our stay was so limited (but a part of one day was spent there), that we could not make as thorough an examination of the island as its interesting nature called for.

The richest results obtained in our brief visit were in the department of ornithology. The lake and peat-bogs were tenanted by a diminutive species of duck of the genus *Chaulelasmus*. *C. Couesi* we have named it, in honor of Dr. Elliot Coues. (Bull. Nuttall Orn. Club, vol. i. p. 46, 1876.) This is the second species of the genus known to exist. The other, *C. streperus*, the common gadwall, is almost cosmopolitan; the one is as restricted in its habitat as the other is wide-spread. The markings on the plumage of the two species are almost identical; they differ only in size, and in some minor details of bill and feet.

By far the handsomest of all the feathered tribe of the island is a little lory, the *Coriphilus kuhli.* It belongs to the Polynesian group of parrots, which are distinguished by the predominance of red in their plumage. Though not new to science, yet its discovery, or rather re-discovery, was an important event as determining its habitat. Finsch in his "Papagien" has the following concerning it: "This is one of the rarest parrots existing, only to be found in few museums. It was erroneously said by Wagler to come from the Sandwich Islands. Latterly this rare species does not seem to come to Europe at all, which is surprising, inasmuch as the Society Islands, which thus far have been regarded as their only home, have considerable traffic with Europe. As a special locality, Vigors mentions Tubuititiruba, near Tahiti: Lesson gives Borabora. Bourjot's specimen in the Paris Museum is said to have come from Fanning Island, northwest of Christmas, and northeast of the Phœnix group. But although everything is diametrically opposed to this assertion, it might nevertheless not be improbable that this very island is its true home." Fanning Island is one of this group, and is situated about seventy miles south of Washington Island. These two islands are without doubt the true habitat of this lory, and it is highly improbable that it ever came from any other locality.

The following untechnical description, which is copied from Fanning's Voyages, is sufficient to prove that *C. kuhli* inhabited Fanning's Island at the time of its discovery in 1798. "Amongst the birds was one species about the size of our robin, with a breast of scarlet colored feathers, the under portion of the body being finished off with bright red, the neck of a golden color, back of a lively green, with a yellow beak, except the very points, which were of a bright dun color, the wings and tail being both of a jet black, and the last tipped off with white ; it was a most beautiful and lovely bird with its brilliant and richly variegated plumage."

They were reasonably abundant on Washington Island, and when I signified a desire to a native of the Kingsmill group to have some of the birds alive, he gratified me in the following manner : He took two pieces of bamboo, each about a yard long. On the end of one he perched a tame bird, and from the extremity of the other suspended a running noose. The tame bird, as it was carried about among the cocoanut-trees, uttered a harsh, rasping sound, and wild birds came out of the trees and perched alongside it on the bamboo, when, by means of the other stick, they were carefully noosed.

When caged aboard the ship, they exhibited as pretty a picture of love as one can imagine, well meriting their name of "love-birds." They sat billing and smoothing each other's feathers for hours, and as night came on two would get together, and sleep with their heads turned towards each other. They lived in confinement but a very short time, and bore it badly. Even while we stood watching their lively antics one would tumble off its perch and die, apparently in convulsions.

The only other land bird found on Washington Island belonged to the *Passeres*. It was a flycatcher-like bird. As many of these as were seen were procured, but the specimens were sent home from the Pacific, and before I arrived east to commence the work of identification, they were distributed through the general collection of the Smithsonian Institution and have not yet been found. This is to be deplored, for they would probably be as interesting as the other species obtained from the same locality. A bird similar to these, but smaller and somewhat browner — which I think can be accounted for by the altered conditions of its surroundings — was found on Christmas Island, where it was the only land bird. But this, like the previous species, is mislaid in the collection at Washington.

Christmas Island was discovered by the great English navigator, Cook, and it has been visited a number of times by exploring expeditions. It is therefore not such a *terra incognita* as the ones we have been considering.

It is the largest island of the group, and is situated the furthest to the eastward and southward, in close proximity to the equator. It consists of a narrow rim of land, thirty miles in circumference, inclosing an immense lagoon. All of our research was limited to the western side.

There are unmistakable evidences of an elevation beyond the height to which land can be built up by the waves and tides. North of the lagoon entrance a distinct old beach line could be traced running parallel to an ancient shore ridge, and distant about two hundred yards from the water of the present lagoon. The shore ridge, about twelve feet high, runs north and south, and is about one hundred yards from the sea-beach. Between the ridge and the beach the surface is thickly strewn with coarse coral blocks of the old shore platform. At the time when the sea washed over this platform it was separated from the water in the lagoon only by the breadth of the shore ridge. A tract of land, from two to three hundred yards in width, has been added to the island by upheaval. The massive reef-rock is elevated all along the present shore line. The highest land is from fifteen to twenty feet high.

This island is far removed from the others in its local conditions; there is no fresh water, it rarely or never rains, the vegetation is low and scanty, — the densest of it hardly casting a shadow, — and the white coral sand glows with the direct rays of the sun's heat. It was interesting to note the changed habits of the birds under these altered surroundings. In December, on Palmyra, the gannet (*Sula piscator*) had finished the period of its incubation, and the young were large-sized; on Christmas Island, one month later, we found the same species still sitting on their eggs, and few or no young were seen. These birds were observed to have a very curious habit in the latter locality, which they were not seen to possess on Palmyra. They constructed their nests on the low shrubbery, and under each nest was a mound, two or three feet tall, composed of twigs, and solidly cemented together by their excrement. They evidently occupy the same nest for several successive seasons, — for the lean bushes would hardly furnish a sufficient quantity of twigs to build up the mounds in a single season — and it may be they amuse themselves, while sitting on their eggs, by breaking off all the small branches within reach of their beaks and dropping them under their nests.

The other birds are equally backward in the performance of their marital duties. On Palmyra the *Gygis alba* and the noddy

(*Anous stolidus*) lay their eggs; the former on the naked branches of the trees, which in some instances are hardly greater in diameter than the egg itself, and the latter in well constructed nests of twigs in the forks of the branches of the tall trees. On Christmas Island the larger coral blocks answer the purpose of the first named, and a shallow concavity scooped in the bare ground that of the last.

Most birds are guided by their instinct of self-preservation in selecting a site for the construction of their nests; in fact, I may say this seems to be a law. But in this case there is nothing on the one island, not found on the other, which would drive them to adopt these widely different habits. It is evident that they simply conform to their surroundings. The ground and coral blocks are both present on Palmyra, yet they choose the trees in preference, being guided probably by their taste rather than by a desire for protection.

The sooty terns (*Sterna fuliginosa*) were breeding on Palmyra. Their chosen locality is the extreme eastern point of the island, on the bare clinker beach, almost within reach of the breakers. They make no attempt to construct a nest; nor do they so much as scoop a hole in the ground to receive their eggs, which are dropped apparently anywhere. They live as a community by themselves during the breeding season, and so great are their numbers that they form a cloud when driven from the ground, and their clamor deadens the roar of the surf.

The *Sula cyanops* was breeding on Christmas Island. A few of the same species, all in immature plumage, were nesting on Palmyra. The old and the young were in no instance found nesting together on the same breeding ground; the former were confined to Christmas, and the latter to Palmyra Island. Is it possible that the young individuals are ostracized until they robe themselves in the fashionable dress?

The only other birds found breeding on Christmas Island were the red-tailed tropic-bird (*Phæthon rubricauda*), the *Æstrelata parvirostris*, and a new species of puffin (*Puffinus*), not yet described. The bristly-thigh curlew (*Numenius femoralis*), the golden-back plover (*Charadrius fulvus*), the *Totanus semipalmatus*, and a species of *Tringa* were common to both islands, but were more numerous on Palmyra. The same statement may be applied to the lesser frigate bird (*Tachypetes Palmerstoni*).

These birds constitute the whole avifauna, and are almost the only life of the islands. The sea-birds range away from the land, in pursuit of their finny prey, to a distance varying from sixty to eighty and sometimes even to a hundred miles ; and so unerring are they in their return to their breeding and roosting places, that we were told the captains of the small schooners, who seek the islands to harvest their crop of cocoanuts and to look about for guano, find the objects of their search by laying to, when they imagine themselves somewhere in their vicinity, until evening, when the birds wing their way homeward, and then shaping their course by the direction of the flight of the birds.

The other terrestrial animals of Palmyra are a minute shell, a *Tornatellina*, that clings to the under surface of the fronds of the *Polypodium aureum*, and a land leech that fastens itself to the eyelids of the young birds.

A soldier-crab (*Cœnobita Glivieri*) quits the water and lives on the land at certain seasons of the year, and it may therefore be properly considered terrestrial. They are ubiquitous ; they climb the trees and bushes, dragging after them the heavy shells of the *Turbo argyrostoma.*

Washington Island is a home of the gigantic *Burgus latro.* "In the Pacific this species, or one with closely allied habits, is said to inhabit a single coral island north of the Society group." Since this statement of Darwin's was made, we have gained a much better knowledge of its distribution, so that now it may be said there is scarcely a group of islands in the Pacific Ocean where it is not found. The stories about this crab climbing trees after cocoanuts are entirely unfounded. It lives in burrows in the ground, and feeds on the cocoanuts as they fall from the trees. It first strips off the husk, shred by shred, and then, with its strong pincers, breaks through the shell at the extremity that holds the eyes. The strength of their claws is sufficient to crush a lath in twain, and so tenaciously do they hold on to anything when once they have obtained a grip, that I have known them to hang suspended from a tree for an hour or more, holding on by their claws. Sometimes the unwary native, in searching their burrows with his hand for the fine cocoanut husk which forms their bed, is surprised to find his fingers in the vice-like grasp of the crab ; and it may be interesting to know that in such a dilemma a gentle titillation of the under soft parts of the body with any light material will cause the crab to loose his hold. They are said to visit the sea at night for the purpose of wetting their branchiæ.